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Book Review:

Ridley, M. (2020). *How Innovation Works: And Why It Flourishes in Freedom*[*]

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When you plot data of World GDP per capita against the time scale from 2.5 million years ago to today you get something that looks like a rectangle: a line that hovers a only a tiny little bit above the time (x-) axis from the time when humans began to use flint stones until about the year 1800. Then the curve abruptly swerves by nearly 90 degrees to the north, running nearly in parallel with the y-axis. (You can see such a curve in Beinhocker 2006, p. 10.) The swerve and the continued rapid rise in World GDP per capita represents in a very long historical context the present era of humanity that Angus Deaton calls the "The Great Escape," and that Deirdre McCloskey calls "The Great Enrichment."

There is still much academic debate about the exact causes of the swerve which began with the Industrial Revolution, which also was an Agricultural Revolution. For example, McCloskey (2010; 2016) has argued at great length that the Revolution cannot be explained by a number of causes that economists usually invoke as causes of rapid economic growth, such as physical and human capital, trade, institutions etc. She suggests it was ideas and innovations that caused the swerve: "Our riches did not come from piling brick on brick, or bachelor's degree on bachelor's degree, or bank balance on bank balance, but from piling idea on idea. The bricks, BAs, and bank balances - the capital accumulations - were of course necessary. But so were a labor force and liquid water and the arrow of time." (McCloskey 2016, p. xiii.)

There is more to the debate about the causes of the swerve towards the Great Enrichment than satisfying economic and historic curiosity. The debate also is practically significant in at least two ways that are closely related. First, Edmund Phelps has warned us: "Nations unaware of how their prosperity is generated may take steps that cost them much of their dynamism." (Phelps 2013, p. vii–viii.) Hence, the more we know about the link between innovation and prosperity the less likely we are to weaken or damage this link that so greatly enriches us. Second, there is a the presumption that the more we know about innovation which caused the Great Enrichment, the better we are able to exploit innovation for our sustained enrichment.

The questions for this review then are: What does Ridley's "How Innovation works" contribute toward our knowledge about innovation as a cause for human well-being, and what does the book contribute toward raising our awareness of the linkages between innovation, prosperity, and dynamism in our economies?

Matt Ridley is a zoologist by training, a science writer by profession, a former banker, a peer of the House of Lords by birth, an enlightened libertarian by philosophical outlook, and a self-described rational optimist Two puzzling observations about innovation motivated Ridley to write the book. The first is the observation that "innovation is the most important fact about the modern world, but one of the least well understood. It is the reason most people today live lives of prosperity and wisdom compared with their ancestors, the overwhelming cause of the great enrichment of the past few centuries, the simple explanation of why the incidence of extreme poverty is in global freefall for the first time in history: from 50 per cent of the world population to 9 per cent in my lifetime." (Ridley 2020, p. 4.) The other is, "The surprising truth [is] that nobody really knows why innovation happens and how it happens, let alone when and where it will happen next." (Ridley 2020, p. 5.) Some economists may object by pointing to the many contributions by economists to our understanding of innovation. That objection would hardly lead Ridley to reconsider his verdict. He insists, "No economist or social scientist can fully explain why innovation happens, let alone why it happens when and where it does." (Ridley 2020, p. 7.)

The term innovation has qualities of a chameleon - it changes its colors and hues easily with its context environment. Helpfully, Ridley provides his readers with a definition of innovation that he has adopted from the economist Edmund Phelps: innovation is "a new method or new product that becomes a new practice somewhere in the world." (Ridley 2020, p. 4.)

Ridley tries to contribute to our understanding of innovation in two steps. He first tells stories about innovations, and he then presents insights about innovations. I talk about the stories first.

Ridley is not a historian who dredges dusty, cavernous archives for new historical evidence and all of his innovation stories seem to be based on innovations that have been reported earlie. His innovation stories cover a wide range of domains that includes energy, public health, transport, food, low-technology, communications and computing, and prehistoric innovation. Ridley notes that he has left out innovation in the arts. Most of the stories are about technological innovations and only a few are concerned with institutional ones. Stories about beneficial innovations dominate but one chapter tells about innovations that were fakes, frauds, fads, and failures, and another one relates cases of resistance to innovation.

I cannot summarize here all of the more than fifty innovation stories in the book. Instead, I highlight the nine stories in the book that are concerned with food and agriculture innovations. Taken together and arranged in chronological sequence the stories extend from the invention of cooking a couple of million years ago or so, to the emergence of farming which began some 10,000 years ago and may have lasted several millennia, and on to CRISPR which is arguably the hottest agricultural innovation of the day. Several of the stories are probably well known to most readers of this journal. Few will have missed the story of the potato which the Spanish brought from South America to Europe in 1567. The potato's diffusion was slow initially but was helped by lazy armies that often left untouched potatoes that were still in the ground because their soldiers preferred the more convenient plunder of harvested wheat that lay ready for the taking in farmers' granaries. Most, or all agricultural economists also know the story of

Fritz Haber who discovered in 1908 how nitrogen from of the air can be turned into ammonia, and of Carl Bosch's inventions at BASF that turned Haber's discovery into a highly efficient production process on which now nearly half of the world's people rely for their food. Ridley also tells us of the wondrously winded ways by which a wheat gene for short stalks made its journey from an obscure agricultural research station in Japan to the agricultural experiment station of Washington State University, then on to Norman Borlaug's wheat breeding program in Mexico, and from there to India's seed breeders and farmers' fields where the genes, together with Haber and Bosch's nitrogen fertilizer, rescued millions of people from menacing famine. Several stories reflect to ongoing struggle, mainly in Europe, between agricultural biotechnology innovations and the powerful pushback by the EU government and by some NGOs. The victims of the pushback whose stories Ridley tells, are *Bacillus thuringensis* technology, Golden Rice, and Glyphosate. This are all biotechnologies that are proven to be beneficial for farmers as well as for the environment, and harmless to the health of people. The only real defect of the innovations is, so I understand Ridley, that the precautionary principle has been invoked against them, like an evil voodoo spell.

The method by which Ridley has obtained his insights about innovation is a black box. Some are certainly derived from the stories, others appear to be strongly influenced by what Ridley had written in his earlier books "The Rational Optimist" from 2010, and "The Evolution of Everything" from 2016. The insights are collected in two chapters. One chapter discusses ten innovation properties that Ridley regards as “Innovation’s essentials”; the other chapter presents eight economic attributes of innovation.

Some of innovation’s essentials that Ridley identifies are likely to be unsurprising to some of his readers but new to others. Few readers who are familiar with innovation will be surprised to learn that innovation is different from invention, that it is gradual, often serendipitous, that it involves trial and error, and that it is a team sport. Moreover, many with a previous exposure to innovation - either through books or through practical experience - will question Ridley's observation that innovation is recombinant in the sense that many new innovations tend to emerge from recombining older ones. What adds novelty to Ridley's list of innovation's essentials are his claims that innovation is inexorable, that it is subject to a hype cycle, that it prefers fragmented governance, and that innovation ever more often results in reduced resource use. Evidence for innovation being inexorable are for Ridley the many near-simultaneous inventions that range from the invention of agriculture (whern simultaneity had been stretched to the extreme), to today's CRISPR-Cas technology. Many of these inventions would have seen the light of the day even if any single one or several of its inventors had prematurely vanished from the face of the earth. The "innovation essential" that I will add to my box of tools for thinking about innovation is the hype-cycle that is in encapsulated in Roy Amara's Law which claims that "people tend to overestimate the impact of a new technology in the short run, but to underestimate it in the long run." (Ridley, 2020, p. 261.). Finally, we should keep one of the innovation's essentials as a reminder for enthusiasts of big government. We should keep reminding them that "One of the peculiar features of history is that empires are bad at innovation ... imperial regimes tend to preside over gradual declines in inventiveness, which contribute to their eventual undoing." (Ridley 2010, p. 264.) Ridley has an equivalent reminder for the friends of big companies, which he considers to be bad at innovation, unless they are prodded on by competition.

The chapter on "The economics of innovation" is also likely to attract diverse reactions from his readers. Probably, few will question his insights that "innovation is a bottom-up phenomenon," that "innovation is the mother of science as often as it is the daughter," and that "innovation increases interdependence." Some economists may, however, question whether these insights are truly economic ones. Many economists, particularly those with a bleeding heart for labor, will cringe when Ridley tells them that "Innovation does not create unemployment”, and some smart marketing people may be tempted to smile condescendingly when they read Ridley's insight that "Innovation cannot be forced upon unwilling consumers." Perhaps the most important economic insight is the one that Ridley has adopted from Paul Romer. It is the insight into the peculiar goods-nature of knowledge and ideas from which all innovations emerge: ideas are non-rival in use so that they can be freely shared, but they may be excludable so that others may be obliged to pay for their use.

The book’s subtitle is, “And why it Flourishes in Freedom.” In the last chapter Ridley tells us why innovation flourishes in freedom: “The main ingredient in the secret sauce that leads to innovation is freedom. Freedom to exchange, experiment, imagine, invest and fail; freedom from expropriation or restriction by chiefs, priests and thieves; freedom on the part of consumers to reward the innovations they like and reject the ones they do not.” (Ridley 2020, p.359). Now we know.

All in all, Matt Ridley has written a highly informative and lively book on innovation. Innovation is a serious matter that we must come to understand better because our generation’s innovations determine the wellbeing of the generations that come after ours. The consequences of our innovations can never be fully foreseen. But we know that we can’t stop trying out new things whilst we struggle to cope and to keep up with our chaotic natural environment, our growing population, and our increasingly complex civilization. We are destined to keep moving ahead and w’d better do it well.

I recommend that you get the book, read it, consider recommending it to your colleagues and friends, and, in case you are a teacher, use it as a text in student seminars on innovation. None of you, your friends, colleagues, and

students is likely to agree with everything that Ridley says with conviction about innovation. But that is exactly what makes the book worth reading: it stimulates informed liberal debate.

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Postscript

An excellent podcast about the book is Matt Ridley's conversation with Russ Roberts at Econtalk: https://www.econtalk.org/matt-ridley-on-how-innovation-works/